

A microscopic image of a diatom, showing its characteristic silica-based, boat-like structure with internal cross-ribs and longitudinal ribs. A green rectangular overlay is positioned in the center of the image, containing the title and author information in white text.

Chlorophyll *a* and Algae Populations in Lakes and Streams

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Outline

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Smith Mountain Lake



Photo: Bob Pohlad

Smith Mountain Lake Water Quality Program

- Project Goals:

- ** (1) Monitor **Trophic Status** of Smith Mountain Lake
 - (2) Monitor Bacterial Quality of Smith Mountain Lake
 - (3) Involve Citizens in Environmental Protection
 - Each volunteer monitors water quality at three stations every other week from Memorial Day to Labor Day
 - Basic Monitors measure water clarity with a Secchi disk
 - Advanced Monitors measure water clarity and collect samples to be analyzed at Ferrum College for **chlorophyll-a** and total phosphorus
 - Schedule: Each season begins with a training session and ends with a picnic where data is reviewed and the program evaluated.

Trophic State

Eutrophication is the process by which lakes are enriched with nutrients, increasing the production of rooted aquatic plants and algae and decreasing water clarity.

oligotrophic - nutrient poor and low productivity; high transparency (deep secchi depth), low chlorophyll-a, low phosphorus

mesotrophic - moderately productive; intermediate clarity, chlorophyll and phosphorus concentration

eutrophic - very productive and fertile; low clarity/shallow secchi; **high chlorophyll** and phosphorus concentrations.

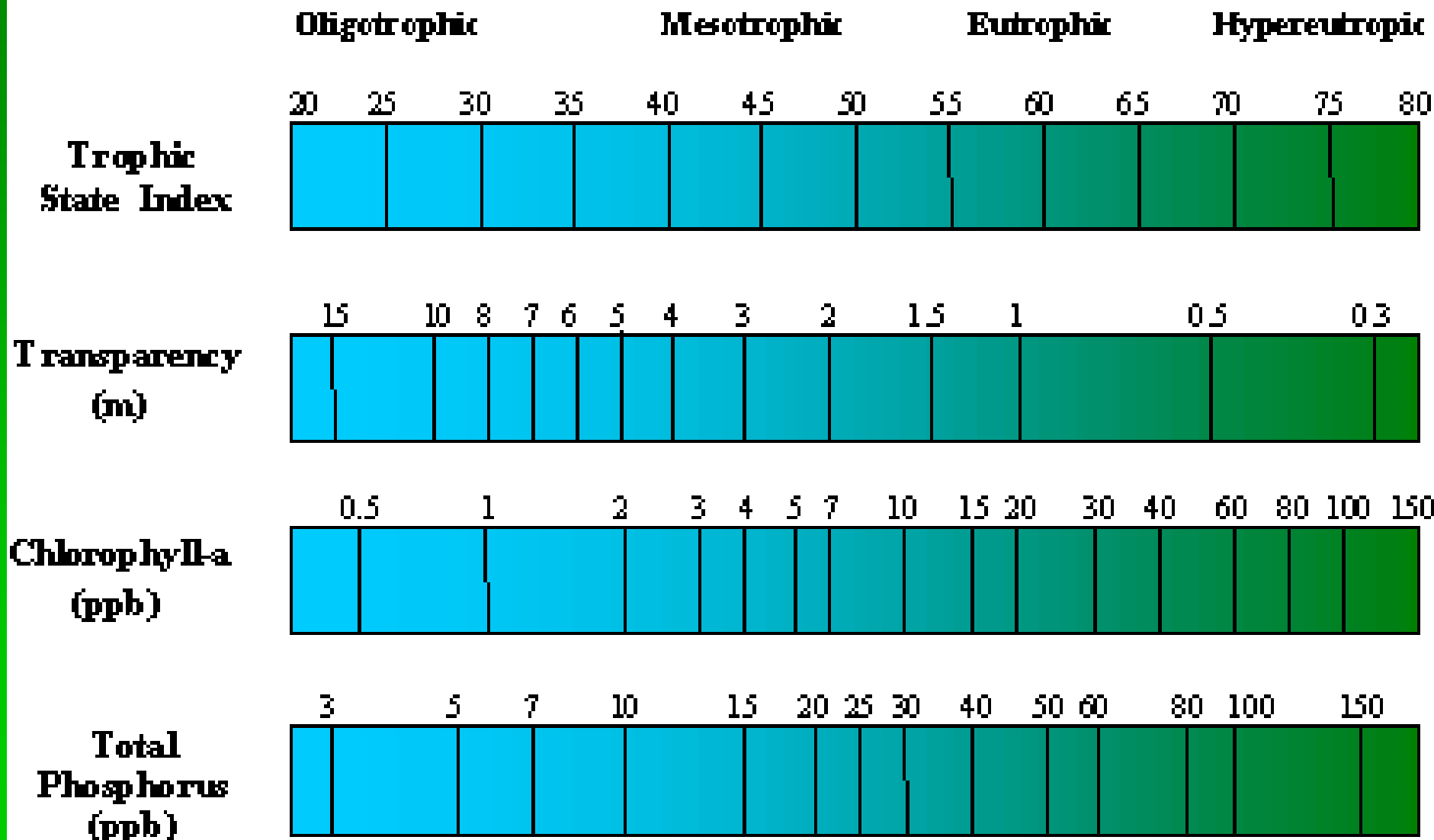
hypereutrophic - extremely productive with noxious surface scums of algae

TROPHIC STATUS INDEX (TSI) & WATER QUALITY

(on a scale from 0 - 100)

- < 40 Oligotrophic; Clear, possible periods of limited anoxia
- 40-50 Mesotrophic; Moderately clear; increasing chance of anoxia in summer; swimmable/aesthetic uses intact
- 50-60 Mildly eutrophic; decreased transparency; anoxia; macrophyte problems; warm-water fisheries only; supportive of swimmable/aesthetic uses; "threatened"
- 60-70 **Blue-green algae** dominance; scums possible; extensive macrophyte problems
- > 80 Heavy **algal blooms** possible throughout summer; dense macrophyte beds; hypereutrophic

Using Total Phosphorus, *Chlorophyll a* and Clarity to Assess Trophic State Index



Chlorophyll *a* Sampling



Chlorophyll *a* Analysis



Chlorophyll *a* Data

Table A5. 2006 Chlorophyll-a data for Smith Mountain Lake sample stations.

	5/28-6/3	6/11-6/17	6/25-7/1	7/9-7/15	7/23-7/29	8/6-8/12	Station avg.	Std. Dev.
Station	conc(ppb)	conc(ppb)	conc(ppb)	conc(ppb)	conc(ppb)	conc(ppb)	(ppb)	
B8	1.00	1.15	3.95	1.45	2.22	4.84	2.44	1.60
B10	1.05	1.99	2.40	3.96	3.53	2.20	2.52	1.06
B12	0.32	1.59	7.72	15.67	10.04	5.75	6.85	5.66
B14	3.05		7.98	13.84	11.29	5.13	8.26	4.40
B16	11.51	2.11	11.55	12.78	18.67	11.85	11.41	5.32
B18	5.68	2.65	10.62	26.48	16.72	14.00	12.69	8.51
B20	7.68	4.93	13.09	18.61	17.56	9.60	11.91	5.48
B22	9.99	18.33	22.97	25.32	14.18	6.84	16.27	7.26
C4	0.17	1.24	2.39	2.04	4.92	4.11	2.48	1.77
C5	2.00	2.39	4.20	2.76	2.34	10.26	3.99	3.17
C6	1.40	1.37	2.79	1.56	2.37	3.17	2.11	0.78
CB11	0.99	2.12	13.80	15.46	5.24	7.34	7.49	5.99

Smith Mountain Lake Water Quality Project 2006

Legend

Average Chlorophyll-a Levels



Map Created by Ferrum College, 2007

Algae in Streams

- Almost all algae in streams is attached to rocks, plants or debris in stream called **Periphyton**
- Sample by scrapping algae film from rocks etc. or place artificial substrate in stream i.e. ceramic tiles or microscope slides
- **Diatoms** are most common followed by filamentous **green algae**.



Algae Sampling



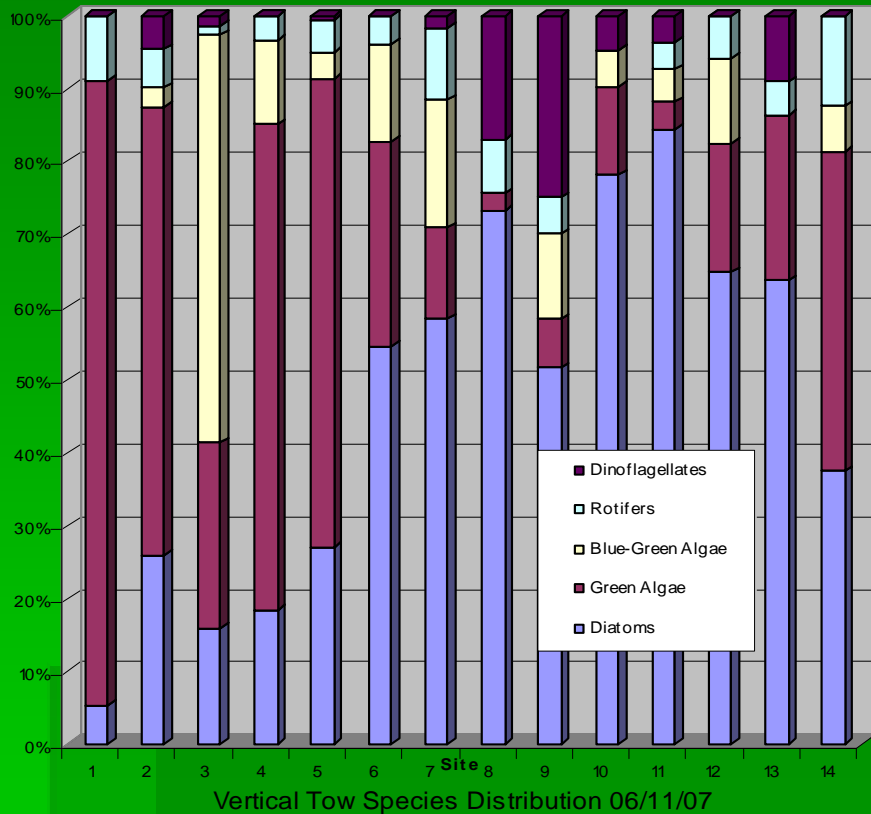
Plankton Count Data Template

Plankton Type	Diatoms						Green Algae
Species	Dinobryon	Asterionella	Diatoma	Fragilaria	Navicula	Unkown	Microspora
Date							
Vertical Tow Counts							
1							
2							
3							
4							
5							
6							
7							
8							
9							
10							
11							
12							
13							
14							
Total species	0	0	0	0	0	0	0

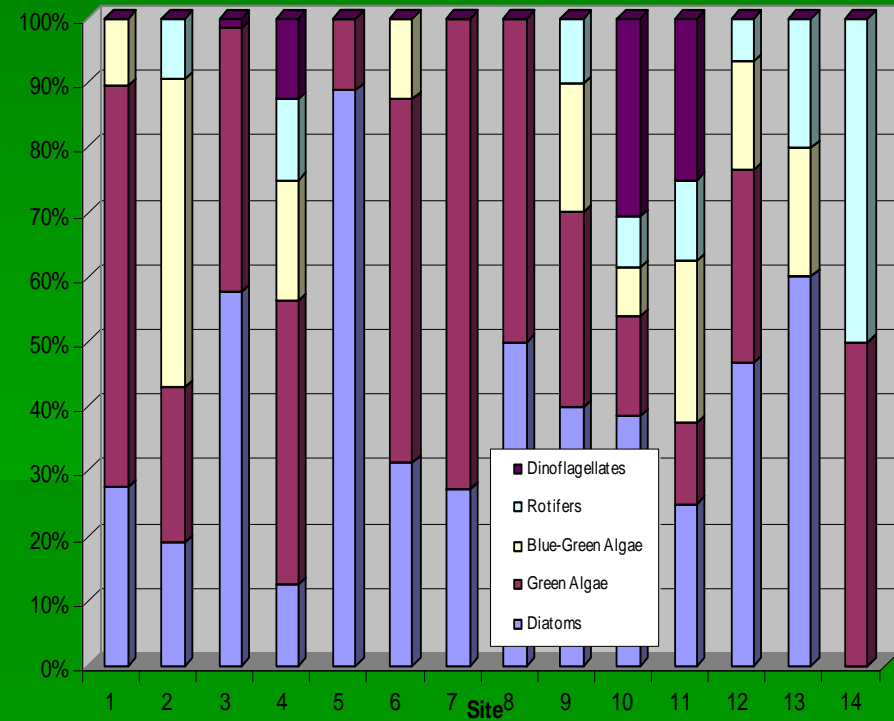
Plankton Count Data Template (cont)

Total Phytoplankton	# of meters towed	Volume towed (L)	Counts per mL in sample	Counts per tow in sample	Counts per mL in lake	Diatoms per mL
29	4	292	5917	1.73E+09	2.0	0.6
21	10	730	4285	3.13E+09	1.5	0.3
64	8	584	13059	7.62E+09	4.5	2.6
16	2.5	182	3265	5.96E+08	1.1	0.1
9	7	511	1836	9.38E+08	0.6	0.6
16	8	584	3265	1.91E+09	1.1	0.3
11	10	730	2244	1.64E+09	0.8	0.2
4	3.5	255	816	2.08E+08	0.3	0.1
10	2	146	2040	2.98E+08	0.7	0.3
13	10	730	2653	1.94E+09	0.9	0.3
8	2	146	1632	2.38E+08	0.6	0.1
30	4	292	6121	1.79E+09	2.1	1.0
5	3	219	1020	2.23E+08	0.3	0.2
6	4	292	1224	3.57E+08	0.4	0.0
242		0	49378	0.00E+00	16.9	6.8

Smith Mountain Lake Algal Populations



June 11, 2007



June 24, 2007

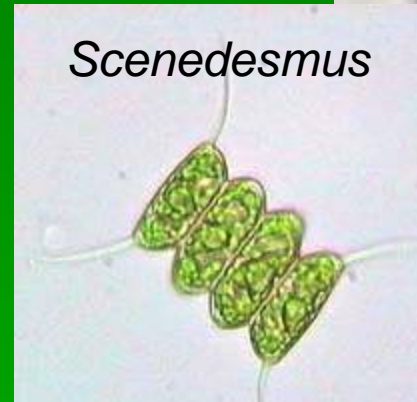
Atlas of Phytoplankton

Ferrum College 2007

Diatoms, Green, and Blue-Green Algae

by: Dr. Bob Pohlاد and
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Algae found in Smith Mountain Lake



A microscopic image of a diatom, showing its characteristic rectangular shape and intricate internal structure, including a grid-like pattern of silica. The diatom is oriented diagonally across the frame. The word "Summary" is overlaid in yellow text on the upper right portion of the image.

Summary

- **Chlorophyll *a*** is an indicator of the trophic status of lakes and reservoirs.
- Trophic status is an important method to assess the water quality in our lakes and reservoirs.
- Algal populations' the assessment indicate the presence of unwanted algae such as blue greens.